TECH TIP # 34

HARDI
HEATING, AIRCONDITIONING & REFRIGERATION DISTRIBUTORS INTERNATIONAL

One of a series of dealer contractor technical advisories prepared by HARDI wholesalers as a customer service.

HOW TO PREDICT FURNACE CAPACITY

A knowledgeable automobile mechanic can check your automobile's radiator in the fall, when it is 32º degrees outside and tells you that the car is "good for 23º below" or some such outdoor temperature.

In a similar manner, the air conditioning service technician can check the capacity of a furnace when it is 32º outside and tell the homeowner that the furnace is good for 23 below --- or whatever the results might actually show.

Here's one approach to how such a check might be undertaken.

> Somewhere in the serviceperson's checklist of things to do of a pre-winter tune-up, is usually a note to determine if a furnace is properly sized for the job. That complaint last winter about "not enough heat" may indicate just a dirty filter, or improper fan control settings. But it could also mean that the furnace isn't big enough to adequately heat the house in sub-zero weather. Or, the homeowner added a room during the summer, or has decided to heat his garage and wants to know if his furnace can handle the extra load on the really cold days. Whatever the reason, and there are many reasons, a furnace capacity check is very often a necessary part of a service call.

Length of Burner Cycle is Key

Here is a method whereby the reserve furnace capacity can be estimated for any design temperature. And with an additional step, an estimate of the outdoor temperature when the furnace would operate continuously can be projected as well. This latter point is obviously the coldest outdoor temperature which can be experienced and desired indoor comfort still be maintained.

The method involves the timing of the burner cycle with a stop watch and then referring the data for a few simple charts.

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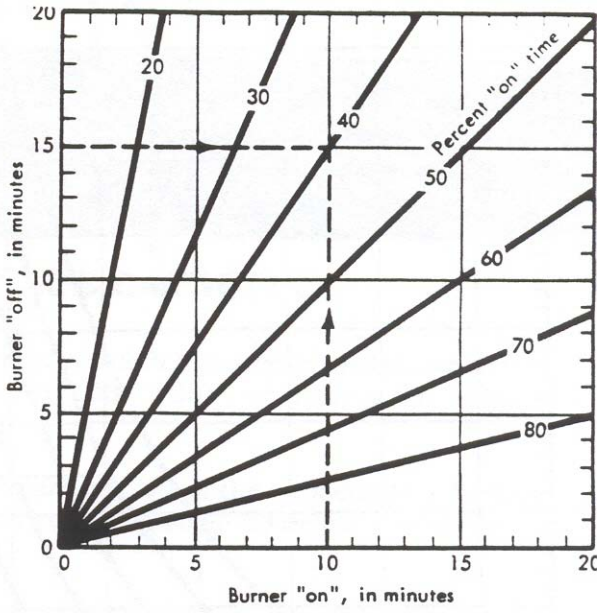
Avoid Extraneous Heating Effects

The charts are based on the degree-day concept of 65º F --- meaning, no heat is required until the outdoor temperature falls below 65º F. The only precautions to observe are that the furnace "on" and "off" time periods should be measured when the blower is operating continuously, and when the thermostat is not affected by solar heat gains or internal loads --- say from cooking, unusually heavy lighting, or occupancy loads. The best time to measure the burner cycle is actually late at night; otherwise conduct the test on a day with a completely overcast day.

For a detailed example of how to use the charts, read the captions accompanying the three charts on the attached page.

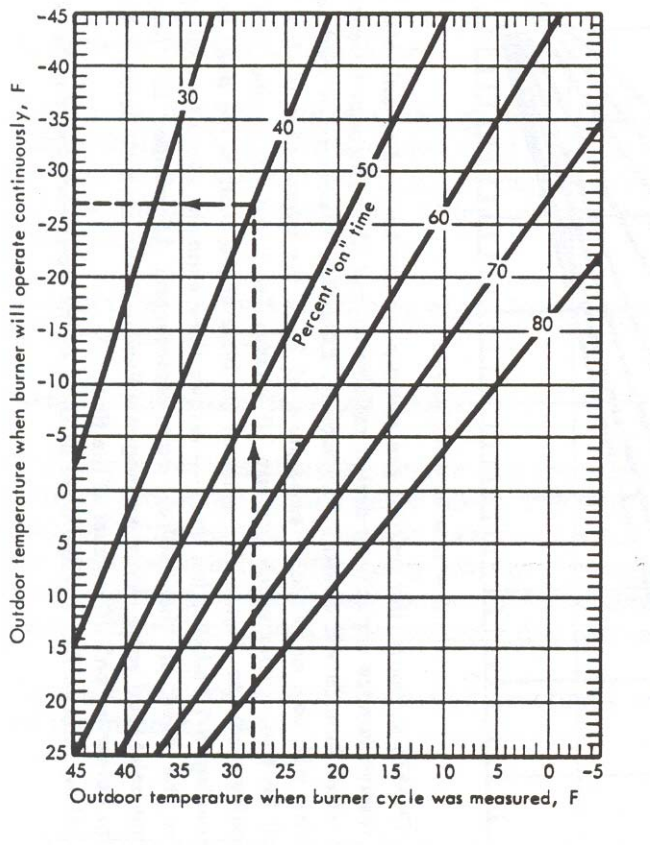
HOW TO PREDICT FURNACE CAPACITY

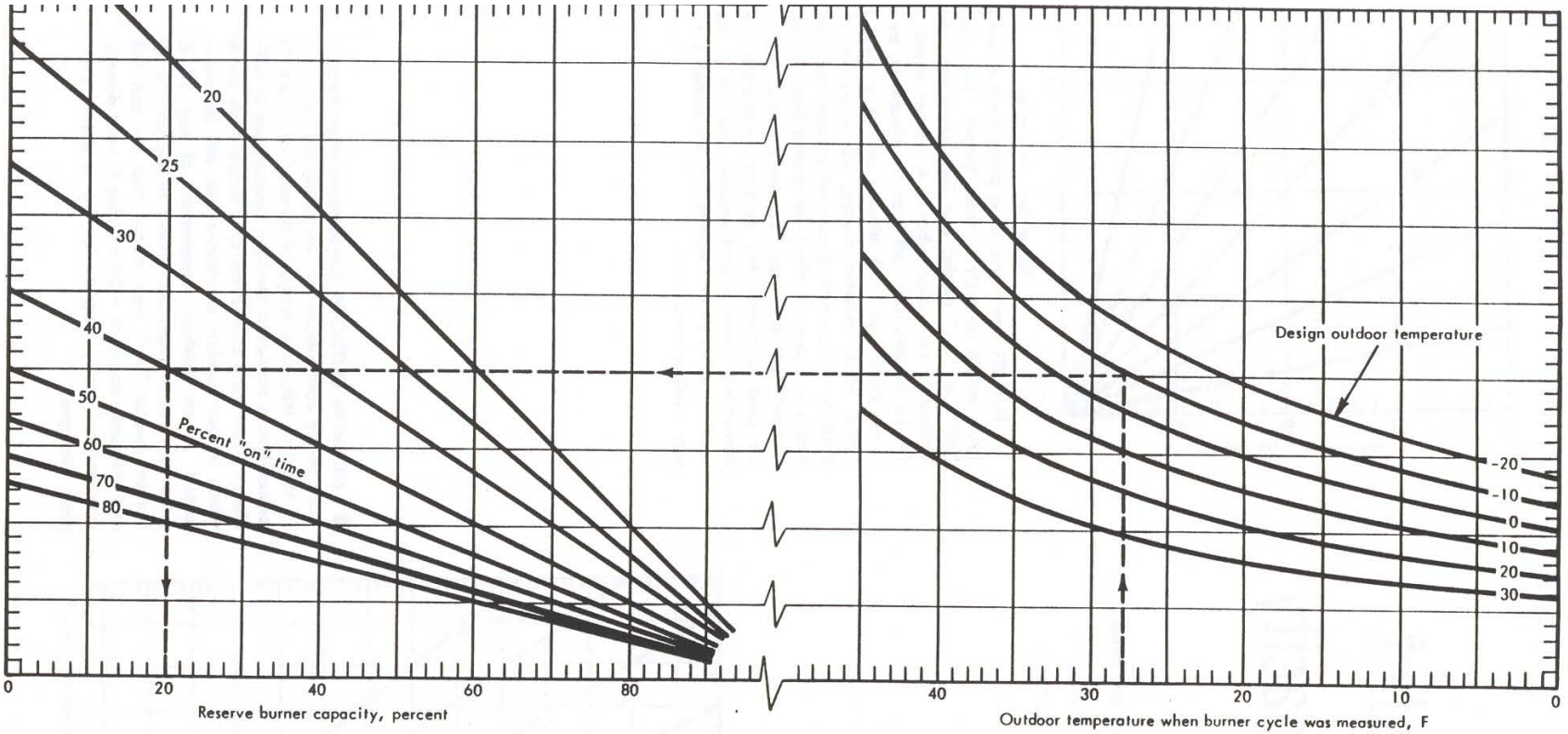
Captions next to charts explain how to determine the "reserve" capacity of a furnace. Please read carefully.



1. BURNER "on" time as a percentage of the total cycle length (a cycle is from burner "on", through "off", to "on" again) can be determined using a stop watch and chart above. A burner timed "on" for 10 minutes and "off" for 15 minutes is, by definition then, "on" 10 minutes out of a total cycle length of 25 minutes. Hence, 10 divided by 25 is 0.40 or 40 percent. Graphical solution to same example is shown in chart by dotted lines. Once the percent "on" time has been determined, Figure 2 can be used to obtain the outdoor temperature when burner will operate continuously, and Figure 3 can be used to arrive at the reserve furnace capacity at design outdoor conditions.

2. MINIMUM OUTDOOR temperature when furnace will operate continuously can be estimated by means of chart below. Knowledge of burner "on" time (in percent) at a particular outdoor temperature is sufficient to determine coldest outdoor temperature under which indoor comfort conditions can still be maintained. At an outdoor temperature of say 28º F, (enter at base of chart and follow dotted line) a 40 percent burner "on" time means that the unit will operate continuously at -27º F (value) is read directly from vertical scale). Caption for Figure 3 (on next page) details complete example.





3 CHARTS shown on this and the preceding page can be used to estimate 1) the reserve furnace capacity at design conditions; and 2) the outdoor temperature when furnace will operate continuously. EXAMPLE: Assume on a mild fall evening with say, an outdoor temperature of 28 F, the burner of a furnace is timed for three cycles which average 10 minutes "on" and 15 minutes "off". Referring back to Figure 1, enter at the base of the chart at the point corresponding to 10 minutes (on time) — arrows show example. Move up until opposite the point on the vertical scale representing 15 minutes (off time). At that point read value shown on diagonal line — in our case 40 percent. This means burner is "on" 40 percent of the time.

Now, refer to Fig. 2. Enter base of chart at the point corresponding to 28 F — the outdoor temperature when the burner cycle was measured. Move up until the diagonal line representing 40 percent "on" time is intersected. Now, move left horizontally, until the vertical scale is reached. Read −27 F at this point — the outdoor temperature when continuous burner begins.

Suppose design outdoor temperature is −10 F; then to find reserve capacity (if any) at design conditions, use chart above. At lower righthand side, enter base of chart at 28 F — corresponding to the outdoor temperature existing during test. Move up vertically until curve representing −10 F is intersected. Now move left horizontally until the diagonal line on the lefthand side of chart — corresponding to 40 percent "on" time — is intersected. Read 20 percent directly from scale at bottom of chart. This is the reserve capacity of the burner in our example case.